

REMARKS

Favorable reconsideration of this application is requested in view of the above amendments and the following remarks. The specification is amended herein to include section headings. Claims 9-23 and 30-35 are canceled without prejudice. Claims 1-5, 7, 24, and 26-29 are amended for formal reasons. Claim 36 is added to recite that the optimum frequency is the frequency at which the impedance of the transformer is a maximum. This is supported by the disclosure, for example at page 4, lines 2-3. Claim 37 is added to recite limitations similar to those in claim 3 as depending from claim 2. Claim 38 is added to recite that the optimum frequency is the frequency at which an impedance of a transformer equivalent circuit of the transformer is a maximum. This is supported by the disclosure, for example at page 2, lines 27-30. Claims 39-42 are added to recite limitations similar to those in claim 7 as depending from claims 2, 36, 5, and 38. Claims 43-46 are added to recite limitations similar to those in claim 8 as depending from claims 39-42. No new matter has been added. Claims 1-8, 27, 29, and 36-46 are pending in the application.

Applicants acknowledge that claims 9-23 and 30-35 are withdrawn from consideration as non-elected claims. Claims 9-23 and 30-35 are canceled herein.

Figures 1 a-e, 5 a-b, 28, and 29 are objected to as not including legends identifying them as prior art. However, Applicants respectfully submit that these drawings are not client admitted prior art, and are not prior art under 35 U.S.C. § 102.

With regard to Figures 1 a-e, Applicants refer to page 5, line 25, and page 8, lines 7-8, which identify these drawings as illustrating embodiments of the claimed invention. Similarly, with regard to Figures 5 a-b, Applicants refer to page 6, lines 1-2 and page 12, lines 20-22. With regard to Figure 28, Applicants note that page 7, lines 18-20 indicate only that the modem data transmission frequency is conventional, not the trace input and output. Similarly, with regard to Figure 29, Applicants respectfully submit that although the smooth transition in duty cycle may be known, as disclosed for example at page 7, lines 21-22, the circuit itself is not conceded to be prior art.

Applicants respectfully submit that Figures 1 a-e, 5 a-b, and 28 are not prior art, and that they do not show only what is old. Reconsideration and withdrawal of the objection is respectfully requested.

The specification is objected to as lacking section headings. The specification is amended herein to include section headings. Applicants believe the amendments overcome the objection. Reconsideration and withdrawal of the objection is respectfully requested.

Claims 1-8 and 24-29 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Applicants respectfully traverse the rejection.

The rejection asserts that claim 1 is unclear as to the arrangement of the coils. Applicants respectfully traverse this assertion. Claim 1 is amended herein to emphasize that one coil is deposited on one side of the printed circuit board, and the other coil is deposited on the opposed side. Reconsideration and withdrawal of the rejection is respectfully requested. Applicants do not concede the correctness of the rejection.

The rejection asserts that claim 1 is unclear as to whether there is a transformer core. Applicants respectfully traverse this assertion. Applicants respectfully submit that the phrase that there is "no transformer core therebetween" emphasizes the fact that the transformer is coreless, as recited in the preamble. Nonetheless, Claim 1 is amended herein to avoid the aforementioned phrase.. Reconsideration and withdrawal of the rejection is respectfully requested. Applicants do not concede the correctness of the rejection.

The rejection asserts that claim 2 is unclear as to the meaning of the maximum impedance, and is not further limiting. Applicants respectfully traverse this assertion. Applicants respectfully submit that it is known that transformers have an impedance to electrical signals that varies with the frequency of electrical signal in question. As disclosed for example at page 2, lines 27-30 and page 4, lines 1-3, at some frequency the impedance is therefore a maximum. Applicants respectfully submit that this a maximum impedance of a transformer or

transformer equivalent circuit is a measurable functional property, and that the limitations regarding this property as recited in the pending claims are definite. Furthermore, Applicants respectfully submit that the recitation that the transformer is adapted to operate at a frequency wherein the impedance is a maximum does constitute a further limitation. Reconsideration and withdrawal of the rejection is respectfully requested. Applicants do not concede the correctness of the rejection.

The rejection asserts that claim 5 is unclear as to the meaning of the maximum impedance. Applicants respectfully traverse this rejection for at least the reasons stated with regard to claim 2. Reconsideration and withdrawal of the rejection is respectfully requested. Applicants do not concede the correctness of the rejection.

The rejection asserts that claim 6 is unclear as to the meaning of “DC to 300 kHz”. Applicants respectfully traverse the rejection. Applicants note that essentially non-varying signals may be generally said to have no frequency, or to have a frequency of 0 Hz. However, although this is technically proper, Applicants respectfully submit that as a matter of convention, such signals are generally referred to as being DC signals. Applicants respectfully submit that this limitation as written would be understood by one of ordinary skill in the art, and that it is definite as-written. Reconsideration and withdrawal of the rejection is respectfully requested. Applicants do not concede the correctness of the rejection.

The rejection asserts that claim 7 is unclear as to how adjusting takes place, and asserts that the means for adjusting is not variable. With regard to the matter of how adjusting takes place, Applicants respectfully refer to 35 U.S.C. 112, sixth paragraph, which states in part that “An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof”. Applicants therefore respectfully submit that claim 7 is not required to specifically recite how adjusting takes place.

With regard to the matter of whether the means for adjusting are variable, Applicants respectfully submit that adjusting the resonant frequency does not necessarily require that the means are variable. For example, Applicants reference page 22, lines 10-16 which disclose use of a capacitor for adjusting the resonant frequency. Applicants respectfully submit that the use of a capacitor as disclosed therein does adjust the resonant frequency, even though in the exemplary case described the capacitor is stated to be a 100 pF capacitor, and is not stated to be variable. Thus, Applicants respectfully submit that claim 7 is functional even if the means for adjusting are not variable. However, Applicants note that there is no disclosure that the means for adjusting cannot be variable, and that the claim does not recite such a limitation.

Reconsideration and withdrawal of the rejection is respectfully requested. Applicants do not concede the correctness of the rejection.

The rejection asserts that claim 24 is unclear as to the arrangement of the coils. Applicants respectfully traverse this assertion. Claim 24 is amended herein to emphasize that one coil is deposited on one side of the printed circuit board, and the other coil is deposited on the opposed side. Reconsideration and withdrawal of the rejection is respectfully requested. Applicants do not concede the correctness of the rejection.

The rejection asserts that claim 26 is unclear as to the arrangement of the coils. Applicants respectfully traverse this assertion. Claim 26 is amended herein to emphasize that one coil is deposited on one side of the printed circuit board, and the other coil is deposited on the opposed side. Reconsideration and withdrawal of the rejection is respectfully requested. Applicants do not concede the correctness of the rejection.

The rejection asserts that claim 26 is unclear as to whether there is a transformer core. Applicants respectfully traverse this assertion. Applicants respectfully submit that the phrase that there is “no transformer core therebetween” emphasizes the fact that the transformer is coreless, as recited in the preamble. Nonetheless, Claim 26 is amended herein to avoid the

aforementioned phrase.. Reconsideration and withdrawal of the rejection is respectfully requested. Applicants do not concede the correctness of the rejection.

Claims 1-2 and 26 are rejected under 35 U.S.C. § 102(b) as being anticipated by prior art Figures 1 a-e or Japan 54-110424. Applicants respectfully traverse the rejection.

With regard to Figures 1 a-e, as previously argued Applicants do not concede that Figures 1 a-e of the claimed invention are prior art. Applicants respectfully submit that they illustrate embodiments of the claimed invention, as disclosed for example at page 8, lines 7-8. As Figures 1 a-e are part of the claimed invention, and therefore do not constitute prior art under 35 U.S.C. 102, Applicants respectfully request reconsideration and withdrawal of the rejection. Applicants do not concede the correctness of the rejection.

With regard to Japan 54-110424, the rejection relies upon the reference to disclose a high frequency coil comprising first and second windings deposited on opposed sides of a printed circuit board with no transformer core. Applicants respectfully traverse this characterization.

The claimed invention according to claims 1 and 26 comprises a coreless printed circuit board transformer comprising first and second windings deposited on a printed circuit board, with the first winding on one side and the second winding on the opposed side. Applicants respectfully submit that Japan 54-110424 does not disclose this structure.

Applicants note that Figure 5 of Japan 54-110424 illustrates a structure having coils on opposite sides of a substrate. However, Applicants also note that Figure 6 shows exactly the same structure, with the addition of a core. Applicants furthermore respectfully point out that in the cross-sections below Figure 6, two distinct shapes of a core are illustrated. Applicants respectfully submit that Figures 5 and 6 do not illustrate two separate embodiments, but rather illustrate two successive steps in the production of an entirely conventional transformer having a core therein; that is, Figure 5 illustrates patterns on a substrate, and Figure 6 illustrates the same structure after a core is set into the substrate.

Applicants respectfully note that Figures 1-4 of Japan 54-110424 illustrate substrates with two conductor patterns on a single side, and therefore do not anticipate the claimed invention according to claim 1 for at least the reason that they do not disclose or suggest windings on both sides of a printed circuit board. However, Applicants respectfully point out that Figures 3 and 4 are similarly identical to Figures 1 and 2, except for the addition of a core, and respectfully submit that Figures 3-4 are likewise illustrative of successive steps in the production of conventional transformers via the addition of cores to the structures illustrated in Figures 1-2.

Applicants respectfully point out that none of the Figures or the English-language abstract of Japan 54-110424 clearly disclose or even suggest a coreless transformer of any structure, much less one with the structure as recited in claims 1 and 26 of the claimed invention. Indeed, Applicants note that the English-language abstract appears to indicate that Japan 54-110424 is directed towards another purpose entirely, namely that of minimizing the space necessary for a transformer on a substrate.

As claims 1 and 26 of the claimed invention includes structure neither disclosed nor even suggested by Japan 54-110424, Applicants respectfully submit that claims 1 and 26 are not anticipated by Japan 54-110424. Reconsideration and withdrawal of the rejection is respectfully requested.

Claim 2 depends from claim 1, and includes the limitations thereof. The above arguments made with regard to claim 1 apply equally to it, and Applicants respectfully submit that separate arguments need not be presented on behalf of claim 2 at this time. Applicants do not concede the correctness of the rejection, and reserve the right to present further arguments against it.

Claims 1-3 and 26-27 are rejected under 35 U.S.C. § 103(b) as being obvious from prior art Figures 1 a-e or Japan 54-110424 in view of Tolfen et al. (U.S. Patent No. 5,579,202). Applicants respectfully traverse the rejection.

The rejection relies upon either Figures 1 a-e of the claimed invention or Japan 54-110424 for general structure. However, as argued above, Applicants respectfully submit that Figures 1 a-e are not prior art under 35 U.S.C. § 102. Furthermore, Applicants respectfully submit that Japan 54-110424 does not disclose or suggest structure analogous to that of the claimed invention.

Tolfsen is relied upon to disclose a coreless transformer operating at a range of 500 kHz to 4 MHz. However, Applicants respectfully submit that even if Tolfsen is correctly characterized, which point Applicants do not concede, Tolfsen does not remedy the deficiencies of Japan 54-110424.

Tolfsen is relied upon to disclose a frequency range alleged to be analogous to that of the claimed invention. However, Applicants note that Tolfsen does not disclose or even suggest operating at a frequency wherein the impedance of a transformer or a transformer equivalent circuit is a maximum. Applicants respectfully point out that the frequency at which impedance is a maximum depends on the physical structure of a particular transformer. Even if one or both references disclosed a frequency range analogous to that of the claimed invention, which point Applicants do not concede, this would not in and of itself to be equivalent to or even suggest a functional requirement that the apparatus is so constructed that such a frequency range results in a maximum impedance.

Furthermore, Applicants respectfully submit that Tolfsen is not suitable for combination with Japan 54-110424. Applicants respectfully point out that Japan 54-110424 appears to be directed solely towards conductors formed on a substrate. In contrast, Tolfsen is not directed towards a conductor or any other structure formed on a substrate, but rather specifically discloses transformers built up around tubes of insulating material, for example at column 3, lines 14-15. As the structure disclosed by Tolfsen and Japan 54-110424 are entirely different, Applicants respectfully submit that Tolfsen is not analogous art to Japan 54-110424.

Furthermore, Applicants respectfully submit that even if Japan 54-110424 and Tolfsen may reasonably be considered to be analogous, which point Applicants do not concede, a person of ordinary skill in the art would have no motivation to combine Tolfsen with Japan 54-110424. Japan 54-110424 appears to indicate a process wherein a transformer is added to a substrate. As 54-110424 appears to exclude the very possibility of a functional device without a core, Applicants respectfully submit that there would be no motivation to attempt to produce a device without a core based on the disclosure of 54-110424, even if combined with Tolfsen.

As claims 1 and 26 of the claimed invention include structure neither disclosed nor suggested by either of Japan 54-110424 or Tolfsen, alone or in combination, Applicants respectfully submit that claims 1 and 26 are not obvious from Japan 54-110424 in view of Tolfsen. Reconsideration and withdrawal of the rejection is respectfully requested.

Claims 2-3 and 27 depend from claims 1 and 26 respectively, and include the limitations thereof. The above arguments made with regard to claim 1 apply equally to them, and Applicants respectfully submit that separate arguments need not be presented on behalf of these dependent claims at this time. Applicants do not concede the correctness of the rejection, and reserve the right to present further arguments against it.

Claims 4-6 and 28-29 are rejected under 35 U.S.C. § 103(b) as being obvious from prior art Figures 1 a-e or Japan 54-110424 in view of Tolfsen, further in view of Commander et al. (U.S. Patent No. 4,748,532). Applicants respectfully traverse the rejection.

Commander is characterized as disclosing a transformer operated by a high frequency carrier signal modulated by a low-frequency switching signal. However, even if Commander is correctly characterized, which point Applicants do not concede, Commander does not remedy the deficiencies of Japan 54-110424 and Tolfsen as argued above.

Claims 4-6 and 28-29 depend from claims 1 and 26 respectively, and include the limitations thereof. The above arguments made with regard to claims 1 and 26 apply equally to

them, and Applicants respectfully submit that separate arguments need not be presented on behalf of these dependent claims at this time. Applicants do not concede the correctness of the rejection, and reserve the right to present further arguments against it.

Claims 7-8 and 25-26 are rejected under 35 U.S.C. § 103(b) as being obvious from prior art Figures 1 a-e or Japan 54-110424 in view of Tolfesen, further in view of Commander, further in view of Miyoshi et al. (U.S. Patent No. 3,866,086). Applicants respectfully traverse the rejection.

Miyoshi is characterized as disclosing a capacitance connected across a secondary winding for adjusting resonance frequency. However, even if Miyoshi is correctly characterized, which point Applicants do not concede, Miyoshi does not remedy the deficiencies of Japan 54-110424, Tolfesen, and Commander as argued above.

Claims 7-8 depend from claim 1, and include the limitations thereof. The above arguments made with regard to claim 1 apply equally to them, and Applicants respectfully submit that separate arguments need not be presented on behalf of these dependent claims at this time. Applicants do not concede the correctness of the rejection, and reserve the right to present further arguments against it.

Claim 25 depends from claim 24, which is not rejected on art grounds herein. However, Applicants note that claim 24 includes limitations similar to those in claim 1. Claim 25 depends from claim 24, and includes the limitations thereof. Applicant therefore respectfully submits that claim 24 and its dependent claim 25 are distinguished over Japan 54-110424 in view of Tolfesen, further in view of Commander, further in view of Miyoshi for at least the same reasons as presented on behalf of claim 1. Applicants do not concede the correctness of the rejection.

As all matters raised in the Office Action have now been addressed, Applicants believe that all pending claims are in condition for immediate allowance. Applicants respectfully request favorable reconsideration of the pending claims in the form of a Notice of Allowance.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicant's primary attorney-of record, Michael D. Schumann (Reg. No. 30,422), at (612) 336-4638.



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Respectfully submitted,

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A handwritten signature in black ink, appearing to read 'Michael D. Schumann', written over a horizontal line.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: HUI ET AL. Examiner: T. NGUYEN
 Serial No.: 09/316,735 Group Art Unit: 2832
 Filed: MAY 21, 1999 Docket No.: 12364.1USI1
 Title: CORELESS PRINTED-CIRCUIT-BOARD (PCB) TRANSFORMERS
 AND OPERATING TECHNIQUES THEREFOR

AMENDED SPECIFICATION PARAGRAPHS MARKED TO SHOW CHANGES

At page 1, lines 3-4:

TITLE OF THE INVENTION: CORELESS PRINTED-CIRCUIT-BOARD (PCB)
TRANSFORMERS AND OPERATING TECHNIQUES THEREFOR

At page 1, line 10:

CROSS-REFERENCES TO RELATED APPLICATIONS: NOT APPLICABLE
STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR
DEVELOPMENT: NOT APPLICABLE
REFERENCE TO A "MICROFICHE APPENDIX": NOT APPLICABLE
 BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

At page 1, line 18:

[PRIOR] DESCRIPTION OF THE RELATED ART

At page 2, line 5:

BRIEF SUMMARY OF THE [PRESENT] INVENTION

AMENDED CLAIMS MARKED TO SHOW CHANGES

1. A coreless printed circuit board transformer comprising first and second windings deposited on [opposed sides of] a printed circuit board, said second winding being deposited on a

side of said circuit board that is opposed to a side of said circuit board whereon said first winding is deposited [and having no transformer core therebetween].

2. A transformer as claimed in claim 1 wherein said transformer is adapted to be operated at an optimum frequency, said optimum frequency being a frequency at which [frequency the] an impedance of a transformer equivalent circuit of said transformer is [at its] a maximum.

3. A transformer as claimed in claim 1 wherein said transformer is adapted to be operated at a frequency of between 300 kHz and 20 MHz.

4. A transformer as claimed in claim 1 wherein said transformer is adapted to be operated by a high-frequency carrier signal modulated by a low-frequency switching signal.

5. A transformer as claimed in claim 4 wherein said carrier signal is at an optimum frequency, said optimum frequency being a frequency [corresponding to a maximum] at which an impedance of said transformer is a maximum.

7. A transformer as claimed in claim 1 further comprising means for variably adjusting [the] a resonant frequency of the transformer.

24. A coreless printed circuit board transformer comprising first and second windings deposited on [opposed sides of] a printed circuit board, said second winding being deposited on a side of said circuit board that is opposed to a side of said circuit board whereon said first winding is deposited [and having no transformer core therebetween, and] said transformer further comprising means for adjusting [the] a resonant frequency of the transformer.

26. A coreless printed circuit board transformer comprising first and second windings deposited on [opposed sides of] a printed circuit board, said second winding being deposited on a side of said circuit board that is opposed to a side of said circuit board whereon said first winding is deposited [and having no transformer core therebetween], wherein said transformer is adapted

to be operated at an optimum frequency, said optimum frequency being a frequency [which is at or] near [the] a frequency at which [the] an impedance of a transformer equivalent circuit is at [its] a maximum.

27. A transformer as claimed in claim 26 wherein said transformer is adapted to be operated at a frequency of [bout] from 100 kHz to at least 20 MHz.

28. A transformer as claimed in claim 26 wherein said transformer is adapted to be operated by a high-frequency carrier signal modulated by a low-frequency switching signal, said carrier signal being at a frequency corresponding to [the] a maximum impedance of the transformer.

29. A transformer as claimed in claim 28 wherein said carrier signal is at a frequency of [about] from 100 kHz to at least 20 MHz and said switching signal is at a frequency of between DC and 300 kHz.